REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Restriction Requirement

Responsive to a January 3, 2006 restriction requirement, applicants have elected claims 1-5 for prosecution, and cancel claims 6-20 herein.

Drawings objections

The Examiner has noted that informal drawings were analyzed, and that formal drawings will be required when the application is allowed. Applicants have submitted formal drawings to the official draftsperson on April 20, 2006. Applicants respectfully submit that these formal drawings are in a condition for allowance.

Claim objections

The Examiner has objected to claim 3, and requested that the term "low temperature" be replaced with "low melting temperature." Applicants concur, and have made the requested correction.

Rejections under 35 U.S.C. § 102

Claims 1-5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Noddin, et al. (U.S. Patent No. 5,276,955). Applicants respectfully traverse this rejection. Noddin teaches a method and apparatus for manufacturing large area multilayer interconnects for electronic substrates and circuit boards using high density area array interconnections created by solid state diffusion. Importantly, the metallurgical joints of Noddin are created

using a solid state diffusion process that joins the donor metal layer 54 and the top surface metal layer 52 without bonding the surrounding dielectric substrate 13. Each interconnect pad of Noddin has a base metal layer, a top metal layer with a donor metal layer disposed thereon. Importantly, the solid state bonding is performed below the flow temperature of the interconnect alloy.

> The [Noddin] invention utilizes a solid state diffusion process or solid phase bonding *effectively below the eutectic or peritectic points of a low flow interconnect alloy* to create the joints 56 of the interconnect system in order to prevent the conductive material of the joints 56 from flowing laterally to short adjacent interconnect areas when the temperature and pressure of the interconnect process surpasses a potential intermediate semi-liquid phase of the conductive material.

Noddin, col. 11, ll.35-47 (emphasis added).

Noddin does not employ a flow-type connection, where the conductive interconnect material is entirely in a liquid phase at some point during the joining process. In the present invention, the melting point of the alloy is greater than that of the solder bumps used for the package. Specification, p.8, ll.28-29. Additionally, Noddin requires the alloy material to be a combination of Au and Sn, which it then acts upon through a solid state diffusion process. In the present invention, the Au metal material comes from the wire itself. An alloy is not created until the Au wire is in contact with the alloying metal under temperature, pressure, and energy lower that that required for bonds that are not exposed to alloy material. Specification, p.9, ll.16-19.

Applicants have amended claim 1 to more distinctly claim the resultant alloying material as originating from the combination of the wire material and an alloying metal under specific temperature, pressure, and energy conditions, and where the alloying metal does not include the wire metallic material, so that the resultant alloying material requires

the wire to be in contact with the alloying metal. In Noddin, the alloying material is already combined without the metallic wire material, and thus does not require flow.

Applicants respectfully submit that the amendment to claim 1 distinguishes the present invention over the cited prior art of Noddin.

Rejections under 35 U.S.C. § 103

Claims 1-5 stand rejected under 35 U.S.C. § 103(a) as being obvious from Jang (U.S. Patent No. 6,096,649), in view of Miller, et al. (U.S. Patent No. 4,518,112). Applicants respectfully traverse this rejection.

Jang teaches a process sequence used to form a gold wire bond to an extended aluminum base structure, which overlays a copper damascene structure. The copper damascene structure is formed on an insulator layer. An aluminum base layer, with an underlying barrier layer, and a thin overlying barrier layer, is deposited and patterned to create a first aluminum based structure, overlying the copper damascene structure, and a second aluminum based structure, on the top surface of the first insulator layer. Jang, col. 2, ll.9-20. Jang uses the aluminum base structure as an intermediate structure between the gold wire and the copper damascene structure. The thin barrier layers about the aluminum base structure are formed of titanium nitride. Jang, col. 4, ll.1-7. Jang does not teach, disclose, or suggest forming an alloying material of an alloying metal in combination with the metallic wire material to create a low temperature, alloy bond.

Miller uses an Au-Sn alloy bond, where the bond has a significantly lower Sn content and a higher melting point. The alloy has a higher melting point than the original alloy of pre-form because it has absorbed the Au layer on the sidewalls of the pin head and the peripheral areas of the pad. Miller, col. 4, ll.41-48. The combination of Jang and Miller

is not an obvious construction of the present invention, in that the alloying material of Miller is already inclusive of the gold (Au) and not a resultant of the wire-interconnect combination under temperature and pressure. Miller does not teach having a layer of Sn that combines with the wire material to form an alloying material of Au-Sn. There is no underlying layer of alloying material that has not combined with the Au wire metal. Moreover, Miller deposits, separately and distinctly, an Au-Sn eutectic. The present invention does not deposit this type of layer, rather a combination of the wire and the alloying metal form a layer *in-situ*. Applicants submit that the present invention, as amended, is patentably distinct from the combination of Jang and Miller.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,

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